

## Nation's most brilliant X-ray beams for research

The Advanced Photon Source at Argonne produces the most brilliant X-rays for research available in the Western Hemisphere. Funded by the U.S. Department of Energy Office of Basic Energy Sciences, the research facility attracts researchers from around the world for experiments in materials science, chemistry, biology, physics, earth and planetary science, and environmental science.

The 1,104-meter circumference APS accelerator complex, large enough to encircle a baseball stadium, houses a complex of machines and devices that produce, accelerate and store a beam of subatomic electrons that is the source of APS X-ray beams.

### Partnerships in science

The APS is a highly successful partnership between government, academia and industry. The Department of Energy provides the operating budget. The University of Chicago operates APS and Argonne for DOE. Academic and industrial partners build the beamlines, using funds from federal and state governments as well as industry and private universities. Users who perform the experiments represent universities, research labs and companies from virtually every U.S. state and several foreign countries.

During the past year, well over individual 2000 users conducted research at the APS. When all 70 beamlines are operational, that number is expected to grow to more than 4000 annually. At the APS, scientists from different institutions, disciplines, and career stages can work together easily. University professors and students interact daily with colleagues from industry and national laboratories, exchanging ideas both formally and informally through collaborations, seminars, and impromptu discussions.



*More than 2,700 researchers a year use the Advanced Photon source for research in materials science, bioscience, chemistry, geology, earth science, and many other fields.*

### Real-time results

Instrumentation advances include a computer cluster that offers the efficiency and flexibility of real-time results in a field where researchers generally wait hours, days or weeks for analyzed data. The computer system allows "X-ray computed tomography." This non-invasive process digitally reconstructs 3-D images or cross-sectional slices of chemical and biological samples using compiled information from a series of X-ray projections. Users can look at the experiment results after just a few minutes, perhaps while the next sample to be studied is being prepared.

Several user groups are bringing a new dimension to biological research at the APS. Slightly more than one-third of all the new protein structures determined at U.S. synchrotron light sources during 2002 and registered with the Protein Data Bank came from APS-based researchers.

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